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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/965,630	09/27/2001	Jason K. Shiepe	PES-0043	2487

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CANTOR COLBURN, LLP
55 GRIFFIN ROAD SOUTH
BLOOMFIELD, CT 06002

EXAMINER	
CREPEAU, JONATHAN	
ART UNIT	**PAPER NUMBER**
1746	

DATE MAILED: 04/05/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/965,630	SHIEPE ET AL.	
	Examiner	Art Unit	
	Jonathan S. Crepeau	1746	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 January 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,5-11,15-25,40-44,50-53,56 and 57* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,5-11,15-25,40-44,50-53,56 and 57* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. This Office action addresses claims 1, 2, 5-11, 15-25, 40-44, 50-53, 56, and newly added claim 57. Claims 1, 2, 5-11, 18-25, 40-44, 50-53, and 56 remain rejected for substantially the reasons of record, while claims 15-17 and 57 are newly rejected as necessitated by amendment. Accordingly, this action is made final.

Claim Rejections - 35 USC § 102

2. Claims 1, 2, 5-7, 9, 10, 18-20, and 50 are rejected under 35 U.S.C. 102(b) as being anticipated by Fuglevand et al (U.S. Patent 6,030,718). The reference teaches a fuel cell comprising first and second electrodes (160), an electrolyte membrane (151), first and second flow fields, and porous flow field members (171, 172) in fluid communication with the flow fields (see Fig. 26). The member comprises a porous support having a series of layers (in layer 171) having a hydrophilicity gradient (see col.11, line 8). Layer 171 comprises particulate carbon and a hydrophobic polymer (e.g., PTFE) and/or a hydrophilic polymer (e.g., ionomer) and layer 172 comprises a carbon cloth integrated with polymer (see col. 9, line 42, col. 9, line 52, col. 10, line 66). Layer 171 comprises 20-90% of support material (i.e., particulate carbon).

Thus, the instant claims are anticipated.

Claim Rejections - 35 USC § 103

3. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fuglevand et al.

The reference is applied to claims 1, 2, 5-7, 9, 10, 18-20, and 50 for the reasons stated above. However, the reference does not expressly teach that the porosity of the flow field members is between 20-80%, as recited in claim 11.

However, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be sufficiently skilled to adjust the porosity of the flow field member of Fuglevand et al. to affect the gas diffusion properties of the electrode. Further, Fuglevand teaches in column 11, line 14 that "in addition to the foregoing, the method further comprises, after the sintering step, applying a predetermined pattern of pressure of a given value to the diffusion layer 171, and which is effective to vary the porosity of the resulting diffusion layer 170." As such, Applicant's claimed porosity range is not considered to distinguish over the reference.

4. Claim 56 is rejected under 35 U.S.C. 103(a) as being unpatentable over WO 97/13287 in view of Speranza et al (U.S. Pre-Grant Publication No. 2001/0008722).

WO '287 teaches a fuel cell comprising first and second electrodes, an electrolyte membrane, first and second flow fields (17), and porous flow field members (16) in fluid communication with the flow fields (see Figs. 2 and 8). The member comprises a porous support modified to provide hydrophilicity or hydrophobicity. The support can be made of electrically

conductive carbon cloth and a polymer (i.e., PTFE or ion exchange resin) (page 12, line 1 et seq.). The member comprises two layers (18, 16), each having a different porosity (see col. 10, line 32 et seq.).

However, the reference does not expressly teach that the flow field members comprise an electrically conductive material selected from the group consisting of Nb, Zr, Ta, Ti, Co, and mixtures and alloys thereof.

Speranza et al. is directed to a screen/frame assembly for an electrochemical cell. The screen functions as a gas diffusion member and is made of Nb, Ni, Co, Zr, Ti, steel, or Ti.

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated to use the screen of Speranza et al. in the flow field member of WO '287. In paragraph 7, Speranza et al. teach that "what is needed in the art is an improved screen assembly which provides structural integrity and simplified cell assembly while maintaining or improving the cell's mass flow characteristics." As such, the artisan would be sufficiently motivated to use the screen of Speranza et al. in the flow field member of WO '287.

5. Claims 40 and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wilson (U.S. Patent 5,641,586).

The reference teaches a fuel cell comprising first and second electrodes, an electrolyte membrane, first and second flow fields (12), and a porous flow field member (24) in fluid communication with the first flow field (see Fig. 1B). The member comprises a porous support modified to provide hydrophilicity or hydrophobicity (see col. 4, line 46 et seq). The porous support may comprise sintered particles, woven metal screens (cloths), and non-woven metal screens (see col. 5, line 10).

However, the reference does not expressly teach that the support is a sintered metal cloth, as recited in claim 40.

However, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated to sinter the metal cloth of Wilson '586. Such a sintering step would serve to increase the structural integrity of the cloth because the fibers would be fused together. Further, as noted above, Wilson '586 teaches "sintered particles," therefore fairly suggesting such a sintering step. As such, the instant claims are not distinguished over the Wilson '586 reference.

6. Claim 53 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wilson '586 as applied to claims 40 and 41 above, and further in view of Sobolewski (2001/0036523).

Wilson '586 does not expressly teach that the porous supports comprise carbon nanotubes, as recited in claim 53.

Sobolewski teaches a fuel cell comprising two electrodes, an electrolyte, gas flow fields, and flow field members between the flow fields and electrodes (see Fig. 1). The flow field members comprise a metallic porous support integrated with a plurality of carbon nanotubes (see paragraph 23).

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated to use the nanotubes of Sobolewski in the flow field member of Wilson '586. In paragraph 22, Sobolewski teaches that "the present invention provides a diffusion substrate structure with improved electromechanical characteristics, more specifically, reduced flow resistance for cross plane flow of active fuel agents and reaction products, and reduced electrical resistance in the direction perpendicular to the plane of said substrate." As such, the artisan would be motivated to use the nanotubes of Sobolewski in the flow field member of Wilson '586.

7. Claims 8 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fuglevand in view of Wilson '586.

Fuglevand is applied to claims 1, 2, 5-7, 9, 10, 18-20, and 50 for the reasons stated above.

Fuglevand does not expressly teach that the porous supports comprise metal screens or sintered metal cloths, as recited in claim 21, or that such supports are made of nickel or steel (claim 8).

As noted above, Wilson '586 teaches or fairly suggests metal screens and sintered metal cloths as supports in porous members for fuel cells.

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated to use the structures of Wilson '586 in the fuel cell of Fuglevand. The disclosure of Wilson '586 indicates that metal screens and sintered metal cloths are functionally equivalent to carbon cloths when used in porous current-collecting members for fuel cells. As such, it would be obvious to substitute the metal screens or sintered metal cloths of Wilson '586 for the carbon paper of Fuglevand. An express suggestion to substitute one equivalent component or process for another is not necessary to render such substitution obvious. *In re Fout*, 675 F.2d 297, 213 USPQ 532 (CCPA 1982); MPEP §2144.06.

Further, the artisan would be motivated to use nickel or steel in the member of Wilson '586. As would be appreciated by the artisan, these materials have characteristics such as high strength and high oxidation resistance. As such, it would be obvious to use these materials in the cloth or screen of Wilson '586, and subsequently of Fuglevand.

8. Claim 52 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fuglevand in view of Sobolewski.

Fuglevand is applied to claims 1, 2, 5-7, 9, 10, 18-20, and 50 for the reasons stated above.

Fuglevand does not expressly teach that the porous supports comprise carbon nanotubes, as recited in claim 52.

As set forth above, Sobolewski teaches a gas diffusion layer comprising carbon nanotubes.

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated to use the nanotubes of Sobolewski in the flow field member of Fuglevand. In paragraph 22, Sobolewski teaches that "the present invention provides a diffusion substrate structure with improved electromechanical characteristics, more specifically, reduced flow resistance for cross plane flow of active fuel agents and reaction products, and reduced electrical resistance in the direction perpendicular to the plane of said substrate." As such, the artisan would be motivated to use the nanotubes of Sobolewski in the flow field member of Fuglevand.

9. Claims 40-44 are rejected under 35 U.S.C. 103(a) as being unpatentable over WO 97/13287 in view of Wilson '586.

WO '287 teaches a fuel cell comprising first and second electrodes, an electrolyte membrane, first and second flow fields (17), and porous flow field members (16) in fluid communication with the flow fields (see Figs. 2 and 8). The member comprises a porous support modified to provide hydrophilicity or hydrophobicity. The support can be made of electrically

conductive carbon cloth and a polymer (i.e., PTFE or ion exchange resin) (page 12, line 1 et seq.). Regarding claims 42 and 43, the member comprises two layers (18, 16), each having a different porosity (see col. 10, line 32 et seq.).

WO '287 does not expressly teach that the porous supports comprise sintered metal cloths, as recited in claim 40, or that the supports comprise three layers, as recited in claim 44.

However, the artisan would be motivated by the disclosure of WO '287 to use three supports in the fuel cell. On page 10, line 34, the reference teaches that "the porous layer (16) is a layer of an electrically conductive porous material having at least two portions with different mean pore sizes." This disclosure fairly suggests that the porous member may have more than two layers. As such, it would have been obvious to use a third support in the member in the fuel cell of WO '287, such support having a larger porosity than the second support (note teachings of increasing porosity on page 14, line 18 et seq.). It is further noted that the duplication of parts is generally not considered to distinguish over a reference (MPEP §2144.04).

Further, as set forth above, Wilson '586 fairly suggests the use of sintered metal cloths as supports in porous members for fuel cells.

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated to use the sintered metal cloths of Wilson '586 in the fuel cell of WO '287. The disclosure of Wilson '586 indicates that sintered metal cloths are functionally equivalent to carbon cloths when used in porous current-collecting members for fuel cells. As such, it would be obvious to substitute the metal screens or sintered metal cloths of Wilson '586 for the carbon paper of WO '287. An

express suggestion to substitute one equivalent component or process for another is not necessary to render such substitution obvious. *In re Fout*, 675 F.2d 297, 213 USPQ 532 (CCPA 1982); MPEP §2144.06.

10. Claims 15, 22-25 and 51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fuglevand in view of WO '287.

Fuglevand is applied to claims 1, 2, 5-7, 9, 10, 18-20, and 50 for the reasons stated above. The reference further teaches that the layer 171 comprises a plurality of layers but does not expressly teach that the layers each have a different porosity, as recited in claims 15, 22 and 51.

WO '287 teaches a flow field member having two layers having different porosity, as set forth above. Further, the reference teaches that the supports may comprise a titanium-based compound (see page 12, line 10).

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated by the disclosure of WO '287 vary the porosity across the plurality of layers in addition to the hydrophobicity. On page 10, line 34, WO'287 teaches that "the porous layer (16) is a layer of an electrically conductive porous material having at least two portions with different mean pore sizes." This disclosure fairly suggests that the porous member may have more than two layers. As such, it would have been obvious to use a third support in the member in the fuel cell of Fuglevand, such support having a larger porosity than the second support (note teachings of

increasing porosity on page 14, line 18 et seq. of WO '287). It is further noted that the duplication of parts is generally not considered to distinguish over a reference (MPEP §2144.04).

11. Claims 16 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fuglevand in view of WO '287 as applied to claims 15, 22-25 and 51 above, and further in view of Wilson '586.

Fuglevand does not expressly teach that the porous supports comprise metal screens or sintered metal cloths, as recited in claims 16 and 17.

As noted above, Wilson '586 teaches or fairly suggests metal screens and sintered metal cloths as supports in porous members for fuel cells.

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated to use the structures of Wilson '586 in the fuel cell of Fuglevand. The disclosure of Wilson '586 indicates that metal screens and sintered metal cloths are functionally equivalent to carbon cloths when used in porous current-collecting members for fuel cells. As such, it would be obvious to substitute the metal screens or sintered metal cloths of Wilson '586 for the carbon paper of Fuglevand. An express suggestion to substitute one equivalent component or process for another is not necessary to render such substitution obvious. *In re Fout*, 675 F.2d 297, 213 USPQ 532 (CCPA 1982); MPEP §2144.06.

12. Claim 57 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fuglevand in view of Wilson '586 as applied to claims 8 and 21 above, and further in view of Speranza et al.

Neither Fuglevand or Wilson expressly teach that the flow field members comprise an electrically conductive material selected from the group consisting of Nb, Zr, Ta, Ti, Co, and mixtures and alloys thereof.

Speranza et al. is directed to a screen/frame assembly for an electrochemical cell. The screen functions as a gas diffusion member and is made of Nb, Ni, Co, Zr, Ti, steel, or Ti.

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated to use the screen of Speranza et al. as the flow field member of Wilson/Fuglevand. In paragraph 7, Speranza et al. teach that "what is needed in the art is an improved screen assembly which provides structural integrity and simplified cell assembly while maintaining or improving the cell's mass flow characteristics." As such, the artisan would be sufficiently motivated to use the screen of Speranza et al. as the flow field member of Wilson/Fuglevand.

Response to Arguments

13. Applicant's arguments filed January 5, 2005 have been fully considered but they are not persuasive. With regard to the Speranza reference, Applicant states that this reference was commonly owned at the time the invention was made. However, this statement is insufficient to remove the reference from use in a §103 rejection because the reference qualifies as prior art

under 35 USC §102(a) as well as §102(e). Such a statement is effective for references qualifying **only** under §102(e). As such, the rejections over Speranza are maintained.

Regarding the Fuglevand reference, Applicant asserts that the reference fails to teach a flow field member having a graded hydrophilicity. However, Appilcant's attention is directed to column 11, line 7 where the terms "most hydrophilic" and "least hydrophilic" are used in reference to the layers of diffusion layer 171. As such, the reference teaches a graded hydrophilicity as set forth in the claims.

Regarding claim 11, Applicant traverses the Examiner's assertion that it would be obvious to adjust the void volume of the flow field member of Fuglevand to be in the range of 20-80%. Although it is believed that this range is obvious over Fuglevand taken alone, U.S. Patent 5,677,074 to Serpico et al. is cited herewith. In column 2, line 49, the reference teaches "(a) a porous carbon fiber sheet having a hydrophobic binder and a porosity of 30 to 70% in electrical contact with (b) a catalyst layer." As such, this disclosure is taken as evidence that porosity values within Applicant's claimed range (20-80%) are conventional in gas diffusion layers and are thus obvious over the Fuglevand reference.

With regard to the Wilson reference, Applicants state that "it appears that the Examiner is taking official notice that it would be obvious to sinter a metal screen by stating that the motivation to sinter the metal screen can be found in the 'increased structural integrity of the cloth'. Applicants respectfully request that the Examiner provide a citation in Wilson and/or another reference that would support the Examiner's position." To clarify, it is first noted that the suggestion to sinter is found in Wilson itself, via the disclosure of "sintered particles." Given

this disclosure, the artisan would then be motivated to sinter the "woven or non-woven metal screens" also disclosed by Wilson. As set forth in *Hawley's Condensed Chemical Dictionary, 14th edition*, cited herewith, the sintering process "increases strength, conductivity, and density." As increased strength and density would be desirable in the metal screens of Wilson, the artisan would be motivated to make this modification. Also cited herewith is an entry titled "Powder Metallurgy and Sintered Materials: 10. Parts with Inherent, Functional Porosity" from *Ullmann's Encyclopedia of Industrial Chemistry*, which discloses that sintered metal fiber nets and sintered electrode plates are known for use in specific applications. As such, it is believed that the rejections over the Wilson reference are proper and are maintained herein.

Regarding claim 8, Applicants state that "since neither nickel nor steel are mentioned in Wilson and Fuglevand et al., it appears that the Examiner is taking official notice that it would be obvious to use these materials. Applicants respectfully request that the Examiner supply a secondary reference indicating that these materials are taught or suggested as in the manner claimed by Applicants." In response, the Speranza reference is cited. This reference has been applied to claims reciting Nb, Co, Zr, Ti, and Ta materials (par. [0021] of the reference). However, in the same passage, the reference also teaches nickel and steel (stainless steel) as being suitable for the screens. As such, these materials are further seen as obvious for use in Wilson based on the disclosure of Speranza.

Conclusion

14. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, THIS ACTION IS MADE FINAL. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

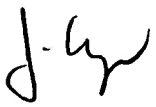
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jonathan Crepeau whose telephone number is (571) 272-1299. The examiner can normally be reached Monday-Friday from 9:30 AM - 6:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Barr, can be reached at (571) 272-1414. The phone number for the organization where this application or proceeding is assigned is (571) 272-1700. Documents may be faxed to the central fax server at (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications

may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Jonathan Crepeau
Primary Examiner
Art Unit 1746
April 1, 2005